

The Key to Effective Quality Circles

By Alan Honeycutt

What makes quality circles work? Research done at Hughes Aircraft Company yielded surprising answers. If you assumed management support was the key to effective quality circles, you'll be surprised, too.

It has been said that a little bit of knowledge in the hands of the wrong people can be a dangerous thing. For members of quality circles at Hughes Aircraft Company's Space and Communications Group (HAC/SCG), however, a little bit of carefully delivered training made them feel they were prepared to meet almost any challenge, solve whatever problems they chose to tackle, and deal effectively with constraints in the problem-solving process.

This decade has seen a dramatic increase in quality-circle (QC) activity in all sectors of the U.S. economy, not only within companies, but across companies. In 1985 Edward Lawler and Susan Mohrman outlined the growth of quality circles in the *Harvard Business Review*: "A 1982 study by the New York Stock Exchange showed that 44 percent of all companies with more than 500 employees had quality-circle programs. Nearly three out of four had started after 1980." Lawler and Mohrman estimated that more than 90 percent of *Fortune 500* companies had QC programs in their structures at that time. An increase in the amount of literature on the topic supports the continuing growth of such programs.

As part of the basis for my doctoral dissertation in organizational management I conducted a study of quality circles. I performed three regression

analyses on data gathered from a questionnaire survey of 83 QC members, with a 100 percent response rate. The purpose of the questionnaire was to discover the most important variable in participants' perceptions of the effectiveness of quality circles.

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The study

In 1982, HAC/SCG implemented a quality-circle program. Since then the program has gained widespread management support. Around 1985, management began to suspect that member training influenced the effectiveness of quality circles (industry trends and the literature supported that suspicion). The company acknowledged the need for investigative empirical research on the variables that influence participants' perceptions of the effectiveness of quality circles, and thus agreed to the study.

The study was designed to determine the most critical variable for predicting QC effectiveness within the HAC/SCG. The study was essentially an extension of Shaker Z. Zahra's doctoral research. Zahra studied 21 predictor variables matched against five criterion

variables in an attempt to identify the key variable that would predict the effectiveness of quality circles.

In his research summary, Zahra discusses several predictor variables, stating that "member training (MT) in quality-circle philosophy, voluntary association (V) with circles, and perceived management support (MS) of circle activities are the major contributors of QCE [quality-circle effectiveness]." In keeping with his work, I focused on the same predictor variables in my study. The criterion variable here was "participant-perceived quality-circle effectiveness" (QCE).

Survey Questionnaire

I developed a survey questionnaire consisting of 14 question items, which are shown in the box. The questions were designed to find out which factors individual QC participants perceived as most important to the effectiveness of their circle activities.

A panel of six divisional QC coordinators tested the questionnaire and judged its content to be valid. I used Cronbach's alpha reliability test to establish a reliability coefficient of .788599. Based on that analysis of variance, the questionnaire is fairly reliable.

Procedures

■ **Permission.** The first step was to secure organizational permission to conduct the research.

■ **Administration.** The next step was to distribute and administer the survey questionnaire. I handed out the questionnaire at the beginning of each quality circle's regular meeting. I explained the purpose of the research and how

Honeycutt is president of a training and organizational development firm, Honeycutt & Associates, 530 North Lucia Avenue, Redondo Beach, CA 90277, 213/374-0799.

to fill out the questionnaire. I asked members to answer the questions as honestly as possible and told them the questionnaire was not marked in any manner. All responses remained confidential. The questionnaire took three to five minutes to complete. When finished, members placed their questionnaires in a manila envelope, which I collected at the end of the session.

I mailed questionnaires and cover letters to several absentee participants and to two active circles outside of California, asking them to complete and mail back the questionnaire immediately.

■ **Follow-up.** The final step was to follow up on the delinquent responses. Ten percent (eight out of 83) of the absentee and non-California QC participants failed to return their questionnaires within a week. I telephoned the tardy participants, and the end result was a 100 percent response.

Statistics

I used a familiar statistical procedure to analyze the data—stepwise inclusion multiple regression. (This formula is clearly described in the *Statistical Package for the Social Sciences*; see "For More Information.") The analysis

proved useful in determining which of the 12 predictor variables, reflecting three constructs (MT, V, and MS), predicted perceived QC effectiveness.

I conducted three regression analyses. In the first two analyses, the criterion variables were QCE1 and QCE2 and the formula was *Regression = criterion variable* (QCE1 and QCE2, independently matched with each successive predictor variable—MT1, MT2, MT3, MT4; V1, V2, V3, V4; and MS1, MS2, MS3, MS4. In the third analysis, I used the average of QCE1 and QCE2. The third formula was *Regression = the average of QCE1 and QCE2* (QCE), in-

Quality-circle participants' questionnaire

1. How freely did you volunteer to join the quality circle?

freely volunteered	ordered to volunteer
5	4
3	2
2	1

2. How helpful was the training you received in quality-circle philosophy and methods?

very helpful	not helpful
5	4
3	2
2	1

3. Do you believe that top management has been supportive of your quality circle?

strongly agree	strongly disagree
5	4
3	2
2	1

4. How would you rate the effectiveness of your quality circle?

very effective	not effective
5	4
3	2
2	1

5. How much influence did your supervisor or manager have on you joining the quality circle?

a lot of influence	no influence
5	4
3	2
2	1

6. How much did your quality-circle training deal with quality-circle philosophy and methods?

very much	not at all
5	4
3	2
2	1

7. How supportive was your supervisor of your quality-circle?

very supportive	not supportive
5	4
3	2
2	1

8. How much influence did your co-workers have on your joining the quality-circle?

a lot of influence	no influence
5	4
3	2
2	1

9. How helpful was the training you received in quality-circle philosophy and methods?

very helpful	not helpful
5	4
3	2
2	1

10. How supportive do you believe the organization is of your quality-circle?

very supportive	not supportive
5	4
3	2
2	1

11. How much influence did members of other quality circles have on you joining the quality circle?

a lot of influence	no influence
5	4
3	2
2	1

12. How much is your quality circle using the training on quality-circle philosophy and methods?

very much	not at all
5	4
3	2
2	1

13. How supportive is your supervisor's manager of your quality-circle?

very supportive	not supportive
5	4
3	2
2	1

14. How effective is your quality circle?

very effective	not effective
5	4
3	2
2	1

dependently matched with the average of each predictor variable (MT, V, and MS). I expected the outcome to be the same after each analysis. The predictor list was specified at 12.

Once I completed the computer analyses, the highest correlated predictor variable with the criterion variable was evident. The table, "Stepwise inclusion multiple regression," shows the statistical results of each analysis.

Results of the first analysis

In the first regression analysis performed (QCE1), I used as a criterion variable the responses from question 4, "How would you rate the effectiveness of your quality circle?" In the first step, member training (MT1) emerged as the predictor variable, with an R value (for regression) of .4544 and an R-squared value (the coefficient of determination) of .2065. In step two, adding MS1 (management support) to the regression equation resulted in an R of .4988 and an R-squared of .2488. Adding MS1 to the regression equation increased the variability of QCE1 by .0424. There were no further stepwise outputs.

In the predictor equation, the coefficients for the two predictors were significant at the .05 level. The null hypothesis—that the measured predictor variables had no significant correlation with the criterion variable—was rejected.

To summarize that analysis, the variability in MT1 by itself accounted for roughly 21 percent of the variability in the criterion variable QCE1. Adding MS1 to the equation significantly increased the predictability of the equa-

tion. Together the two predictor variables accounted for 25 percent of the variability.

Results of the second analysis

In the second regression analysis, quality-circle effectiveness (QCE2) was used as the criterion variable. The predictor variable output was the same as the QCE1 variable outputs. There was only a slight increase in the statistical significance.

In step one, MT1 produced an R of .4996; R-squared was .2498. In step two, adding MS1 to the formula resulted in an R of .5793 and an R-squared of .3356—an increase of .0860.

Again, in the predictor equation, the coefficients for the two predictors were significant at the .05 level. I again rejected the null hypothesis—that there was no significant correlation between any of the predictor variables and the criterion variable.

In summary of the second analysis, the variability in MT1 by itself accounted for approximately 25 percent of the variability in the criterion variable QCE2. Adding MS1 to the equation significantly increased the predictability. R-squared increased to more than one-third.

Results of the third analysis

In the third regression, I averaged the two criterion variables (QCE1 and QCE2), as well as each of the predictor variables (MT1 + MT2 + MT3 + MT4; V1 + V2 + V3 + V4; and MS1 + MS2 + MS3 + MS4). It is unusual to average Likert scales of different semantic properties, but in this instance, the differences

seemed minimal.

Only one variable emerged from the regression output. The only predictor variable reported was member training (MT) with an R of .5370 and an R-squared of .2884.

The regression equation yielded a coefficient for the predictor that was significant at the .05 level, and I again rejected the null hypothesis. The MT predictor variable accounted for 29 percent (.2884) of the variability.

Conclusion

The results of this study enhance Zahra's dissertation research findings that "in fact, there was no single variable that consistently emerged as the most important contributor to QCE. However, member training seemed to be stronger than the rest of the explanatory variables in the QCE model."

My initial prediction was that management support was the most important predictor variable, but the three analyses of the raw data did not confirm that prediction. Management support was a significant contributing factor in two instances when combined with member training, as well as

Stepwise inclusion multiple regression

Criterion Variable	Variable	Step	Multi R (regression)	R Square	R Square Change	Bivariate Correlation
QCE1 (First Analysis)	MT1	1	.4544	.2065	.2065	.4544
	MS1	2	.4988	.2488	.0424	.3522
QCE2 (Second Analysis)	MT1	1	.4996	.2498	.2496	.4996
	MS1	2	.5793	.3356	.0860	.4500
QCE (Third Analysis)	MT	1	.5370	.2884	.2884	.5370

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when considered alone. Overall, however, member training was the best predictor.

Why did member training appear to be the principal predictor in the study? It seems that the participants found that the four hours of training they received on QC techniques were the most important reason for their perceptions of quality-circle effectiveness.

I believe that merely understanding QC principles and learning how to

apply them properly enabled members to conclude, "We believe we are effective, therefore we are effective." A few hours of specific training gave them the confidence to face challenges they may not have been able to handle before, to take on and solve tough problems, and to overcome constraints in the problem-solving process. In this case, a little bit of knowledge was a smart investment at Hughes Aircraft.



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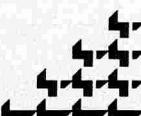
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